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REMARKS

Claims 1-4, 6-19, 21 and 22 are pending in this application. By this Amendment, Applicants amend the specification and Claims 1, 2, 6, 7, 10, 12, 18, 19 and 21, and cancel claims 5 and 20.

Applicants have amended the specification to describe a feature clearly shown in the originally filed drawings (originally filed Fig. 5). No new matter is added by this amendment to the specification. Accordingly, Applicants respectfully request entry of the amendment to the specification.

The specification was objected to for allegedly failing to provide proper antecedent basis for the claimed subject matter because of the subject matter recited in Claim 5. In addition, the drawings were objected to under 37 CFR 1.83(a) because the originally filed drawings did not show the feature of Claim 20. Applicants have canceled Claims 5 and 20 to eliminate the objectionable subject matter. Accordingly, Applicants respectfully request reconsideration and withdrawal of the objection to the specification and drawings.

Claims 1, 6, 7, 18 and 21 were objected to because of various informalities contained therein. Applicants have amended Claims 1, 6, 7, 18 and 21 to correct the informalities noted by the Examiner. Accordingly, Applicants respectfully request reconsideration and withdrawal of the objection to Claim 1, 6, 7, 18 and 21.

Claim 5 was rejected under 35 USC Section 112, first paragraph, and Claims 5 and 7 were rejected under 35 U.S.C. 112, second paragraph, for allegedly being indefinite. Applicants have canceled Claim 5 and have amended Claim 7 to correct the informalities noted by the Examiner. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of the claims under 35 USC Section 112, second paragraph.

Claims 1-11, 21 and 22 were rejected under 35 U.S.C. 103(a) as being obvious in view of Pei et al. (US 5997,317). Claims 12-20 and 22 were rejected under 35 U.S.C.

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103(a) as being unpatentable over Pei et al in view of Swamy et al. (US 5,613,033).

Applicants respectfully traverse these rejections.

Applicants' claim 1 has been amended to recite:

"An electrical connector portion, comprising:
an insulating substrate having a first major face and an oppositely disposed second major face;
a plurality of non-recessed apertures extending through the insulating substrate from the first major face to the second major face;
a plurality of elongated electrically conducting pins extending through the non-recessed apertures;
a plurality of insulating posts connected to the first major face of the insulating substrate; and
a plurality of reflowable electrical conductors disposed adjacent the first major face and arranged **such that respective ones of the plurality of insulating posts contact each of the plurality of reflowable electrical conductors at four separate locations on a respective reflowable electrical conductor so as to position the respective reflowable electrical conductor and so as to eliminate excess space to prevent unintentional occupancy of an adjacent one of the plurality of reflowable electrical conductors;**
wherein each elongated electrically conducting pin extends into a respective reflowable electrical conductor at a fusing interface and **each elongated electrically conducting pin has a diameter that is less than a diameter of the respective reflowable electrical conductor at the fusing interface** (emphasis added).

Applicants' claims 12, 18 and 21 have been amended to include similar recitations as those emphasized above.

As described on page 3 of the originally filed specification, Applicants' claimed invention solves problems with prior art devices such as "variation in the dimensions and/or placement of solder balls at the interface can lead to an uneven or non-coplanar interface and intermittent or poor electrical contact. Also, the presence of oversized or extra solder balls present in the connector interface can result in shorted connections and degraded connector performance."

In addition, as described on page 7 of the originally filed specification, Applicants' claimed invention also provides the following advantage:

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"In other words, the posts 28 are disposed such that the presence of the posts 28 **prevents extra solder balls 30 from sitting on the surface of the connector portion 20 where they might potentially participate in an unplanned electrical connection (i.e., an electrical short circuit) on the connector portion 20**" (emphasis added).

As further described on pages 7 and 8 of the originally filed specification:

"However, any convenient cross-sectional shape may be chosen that allows the posts 28 to define spaces over each of the apertures 24 large enough for solder ball occupation **while reducing the remaining probability of solder ball occupation elsewhere on the surface of the connector portion 20**. It is contemplated that by precisely controlling post size, cross-sectional shape, and positioning, the surface of the connector portion 20 may be tailored such that only solder balls 30 of precisely controlled sizes may be placed thereupon **without any excess space remaining for unintentional solder ball occupancy**" (emphasis added).

In the prior art rejection of the claims, the Examiner appears to be relying upon the teaching in Prior Art Fig. 6 of Pei et al. AND the inventive teaching of Pei et al. as shown in Fig. 5. That is, the Examiner seeks to combine the features of the two insulating posts of the invention of Pei et al. shown in Fig. 5 with the structure of Prior Art Fig. 6 of Pei et al.

However, a thorough consideration and analysis of the full disclosure of Pei et al. must be performed in order to fully understand what is taught by Pei et al. and whether such a combination of Fig. 5 of Pei et al. and Prior Art Fig. 6 of Pei et al. is possible and whether there is sufficient motivation for such a combination.

As described in Column 1 of Pei et al., Prior Art Fig. 6 thereof teaches a conventional ball grid array connector in which solder balls must first be reflowed to a tail 511 of a contact or electrically conducting pin 51, before the solder ball is reflowed to a solder pad of a printed circuit board. The problem recognized by Pei et al. with respect to the conventional structure shown in Fig. 6 thereof was that it "is difficult to

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properly position the solder ball 23 to the solder tail 511 because the bottom 512 of the solder tail 511 is only a relatively small plane." The problems with the structure of Fig. 6 are further described as "some of the solder balls 23 (not shown) are apt to be attached to one edge of the soldering tail 511 which in turn damages the coplanarity of the solder balls 23." That is, there was a problem with making sure that the tip of the contact or pin 51, instead of a side surface of the contact or pin 51, is attached to the solder ball.

To solve this problem with the conventional ball grid array connector shown in Fig. 6, Pei et al. provides various embodiments shown in Figs. 1-5, **EACH** of which have a unique flat horizontally-extending disk-like plate defining a soldering portion of the contact for soldering to the solder ball, wherein **EACH** flat horizontally-extending disk-like plate defining the soldering portion has a diameter that larger than a diameter of a solder to which it is attached. That is, the invention of Figs. 1-5 of Pei et al. provides a unique soldering portion that is defined by a HORIZONTALLY-extending disk-like plate bent from the vertical contacting portion 20 of the contact 2 so as to ensure proper positioning of the soldering ball on the contact 2.

Pei et al. explains that "the solder ball 23 may be guaranteed to be soldered on the bottom 22 of the soldering portion 21 rather than on the edge thereof because the bottom 22 has a width larger than the diameter of the solder ball 22" and further "since the rectangular bottom 22' has a relatively large area, the solder ball 23 may be guaranteed to be soldered on the region of the rectangular bottom 22' thereby guaranteeing the coplanarity of the solder balls."

In the third embodiment of Pei et al. shown in Fig. 3, a recess 24 is provided to ensure that the solder ball 23 is limited to "a center of the bottom 22."

Further, the embodiments of Figs. 4 and 5 of Pei et al. provide lugs or standoffs "for limiting the solder ball 23 to be soldered on a center of the bottom 22."

Thus, it is quite clear that the invention of Figs. 1-5 of Pei et al. are directed to solving the problem of having a solder ball attached to a side of a conductor pin, which deteriorates coplanarity. The solution is to ensure that the solder ball is soldered to a

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center of the conductor pin, by providing a horizontally extending disk-like plate having a diameter that is much larger than a diameter of the portion of the conductor pin that will be attached to the solder ball.

In contrast, Applicants' claimed invention recites that "each elongated electrically conducting pin has a diameter that is less than a diameter of the respective reflowable electrical conductor at the fusing interface." This is exactly opposite to the structure of each of the embodiments of Figs. 1-5 of Pei et al. That is, Pei et al. clearly teaches the opposite of Applicants' claimed invention.

Therefore, Pei et al. cannot be relied upon in an obviousness rejection of Applicants' claimed invention since it is error to find obviousness where references diverge and teach away from the invention at hand. W.L. Gore & Assoc. v. Garlock Inc., 721 F.2d 1540, 1550, 220 USPQ 303, 311 (Fed. Cir. 1983).

In addition, the Examiner has failed to provide any statement of motivation for combining only one of the features of Fig. 5 of Pei et al. (the two insulating standoffs 16 of Fig. 5) with the structure of Prior Art Fig. 6 of Pei et al. The Examiner did state that "it would have been obvious to a person of ordinary skill in the art at the time the invention was made to form the first major surface with a plurality of insulating posts, as taught by Pei, to limit the position of the reflowable conductors." Thus, the Examiner seeks to ignore the clear teaching of Figs. 1-5 of Pei et al. requiring the use of a horizontally extending disk-like plate having a diameter that is much larger than a diameter of the portion of the conductor pin that will be attached to the solder ball, and instead pick and choose to use only the two insulating posts shown as an added feature in Fig. 5. However, to combine ONLY the two insulating standoffs of Fig. 5 of Pei et al. with the structure of Prior Art Fig. 6 of Pei et al. without including the inventive feature of Fig. 5 (and all other embodiments of the invention of Pei et al.) of the horizontally extending disk-like plate having a diameter that is much larger than a diameter of the portion of the conductor pin that will be attached to the solder ball is an improper hindsight reconstruction of Applicants' claimed invention and ignores the clear teachings of the

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invention of Pei et al.

It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. In re Fritch, 972 F.2d 1260, 23 USPQ 2d 1780, 1784 (Fed. Cir. 1992).

Further, it is impermissible within the framework of § 103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. In re Wesslau, 353 F.2d 238, 241, 147 USPQ 391 (CCPA 1965).

Further, such a proposed combination ignores the clearly divergent teachings of Figs. 1-5 of Pei et al. of having a horizontally extending disk-like plate having a diameter that is much larger than a diameter of the portion of the conductor pin that will be attached to the solder ball, and that of Fig. 6 in which the conductor pin has a diameter that is much less than a diameter of the respective solder ball it is to be attached to. Thus, Pei et al. Fig. 6 clearly cannot be combined with Pei et al. Fig. 5 in the manner proposed by the Examiner.

Further, such a proposed combination ignores the clearly divergent teachings of Figs. 1-5 of Pei et al. of having a horizontally extending disk-like plate having a diameter that is much larger than a diameter of the portion of the conductor pin that will be attached to the solder ball, and that of Fig. 6 in which the conductor pin has a diameter that is less than a diameter of the respective solder ball it is to be attached to. Thus, the selected features of Pei et al. Fig. 5 clearly cannot be combined with Pei et al. Fig. 6 in the manner proposed by the Examiner.

At best, the Examiner's comments regarding obviousness amount to an assertion that one of ordinary skill in the relevant art would have been able to arrive at

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Applicant's invention because he had the necessary skills to carry out the requisite process steps. This is an inappropriate standard for obviousness. That which is within the capabilities of one skilled in the art is not synonymous with obviousness. See Ex Parte Levengood, 28 USPQ 2d 1300 (Bd. Pat. App. & Inter. 1993). The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification. In re Gordon, 221 USPQ 1125 (Fed. Cir. 1984). As noted above, the prior art clearly teaches away from the combination proposed by the Examiner, instead of suggesting the combination.

Further, Applicants' claimed invention recites the feature of respective ones of the plurality of insulating posts contact each of the plurality of reflowable electrical conductors at four separate locations on a respective reflowable electrical conductor so as to position the respective reflowable electrical conductor and **so as to eliminate excess space to prevent unintentional occupancy of an adjacent one of the plurality of reflowable electrical conductors.**

As noted above, Pei et al. only the recognized the problems with a solder ball being attached to a side rather than a tip of the conductor pin. There is absolutely no recognition of the problem solved by the present invention or Applicants' claimed solution to this undiscovered problem. In addition, Pei et al. clearly fails to teach or suggest Applicants' claimed feature of respective ones of the plurality of insulating posts contact each of the plurality of reflowable electrical conductors at four separate locations on a respective reflowable electrical conductor so as to position the respective reflowable electrical conductor and so as to eliminate excess space to prevent unintentional occupancy of an adjacent one of the plurality of reflowable electrical conductors.

Pei et al. teaches that the use of only two insulating posts or "standoffs" in Fig. 5 is sufficient to limit the position of the solder ball. But these two posts do not prevent an adjacent solder ball or solder from occupying an excess space around the solder ball.

The Examiner stated that "Pei, as modified, discloses substantially the claimed

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invention except for the number of contact locations, i.e. the number of posts per conductor." However, as noted above, Pei et al. clearly fails to teach or suggest Applicants' claimed combination including the feature of respective ones of the plurality of insulating posts contact each of the plurality of reflowable electrical conductors at four separate locations on a respective reflowable electrical conductor so as to position the respective reflowable electrical conductor and **so as to eliminate excess space to prevent unintentional occupancy of an adjacent one of the plurality of reflowable electrical conductors.**

The Examiner also argued that "It would have been obvious to one having ordinary skill the art at the time the invention was made to form the contact portion of Pei having four (two pairs) insulating post for each reflowable conductor in order to limit the reflowable conductor in many directions, and since it has been held that mere duplication of parts of a device involves only routine skill in the art. St. Regis Paper Co. v. Bemis Co., 193 USPQ 8."

Of note, the Examiner has relied upon St. Regis Paper Co. v. Bemis Co., 193 USPQ 8 (7th Cir. 1977) in his rejection of claims 1-11, 21 and 22. St. Regis Paper Co. v. Bemis Co. comes from a line of cases that required a synergistic effect of old combination claims. This line of cases was clearly rejected and overturned in Republic Industries v. Schlage Lock Co., 200 USPQ 769 (7th Cir. 1979), and thus, St. Regis Paper Co. v. Bemis Co. should no longer be relied upon in rejecting claims. It should also be noted that the MPEP does not even mention St. Regis Paper Co. v. Bemis Co., and thus, it is clearly improper for the Examiner to rely upon this rejected and invalid case law.

Furthermore, the Examiner's conclusion regarding obviousness ignores the clear evidence against increasing the number standoffs in Fig. 5 of Pei et al., and also ignores the fact that there is a clearly unique arrangement of Applicants' claimed insulating posts that is not disclosed or even suggested in Pei et al.

Pei et al. clearly teaches that a solder ball will be positioned in a center of a

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horizontally-extending flat bottom portion 22 of a contact 2 due to the bottom portion of the contact having a diameter that is greater than a diameter of the solder ball, and that two insulating standoffs could be used in conjunction with the inventive greater-diameter flat bottom portion 22 to limit the position of the solder ball. Since the solder ball is placed on the horizontally-extending flat bottom portion 22 of the conductive contact 2 of Pei et al., the solder ball has a natural tendency to remain in the center of the horizontally-extending flat bottom portion 22. Hence, the horizontally-extending flat bottom portion 22 provides an additional, different type of positioning function not present in Applicants' claimed invention or in Fig. 6 of Pei et al. Thus, in the invention of Pei, only two insulative standoffs 16 are needed and no additional standoffs are needed or even contemplated because of the use of the horizontally-extending flat bottom portion 22.

Even, assuming for the sake of argument, that there was sufficient motivation to use four insulating standoffs in the structure of Fig. 6 of Pei et al. as argued by the Examiner, there is absolutely no teaching or suggestion of an arrangement or construction of these four standoffs that would prevent an adjacent solder ball or solder from occupying an excess space around the solder ball.

Pei et al. clearly failed to recognize the problem solved by Applicants' claimed invention, and clearly failed to recognize the necessity or desirability of the above-identified features of Applicants' claimed invention.

Swamy was relied upon for its teaching of a plurality of insulating plates. However, Swamy clearly fails to teach or suggest Applicants' claimed features of "a plurality of reflowable electrical conductors disposed adjacent the first major face and arranged **such that respective ones of the plurality of insulating posts contact each of the plurality of reflowable electrical conductors at four separate locations on a respective reflowable electrical conductor so as to position the respective reflowable electrical conductor and so as to eliminate excess space to prevent unintentional occupancy of an adjacent one of the plurality of reflowable**

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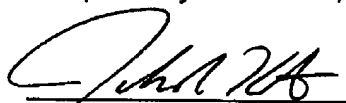
electrical conductors; wherein each elongated electrically conducting pin extends into a respective reflowable electrical conductor at a fusing interface and each elongated electrically conducting pin has a diameter that is less than a diameter of the respective reflowable electrical conductor at the fusing interface" (emphasis added).

In view of the foregoing amendments and remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance are respectfully requested.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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